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**Heating sheet for microwave cooking - comprises paper-type base material contg. heat-resistant conductive fibres of metal and carbon with conductive surface layer**

**Patent Assignee:** LION CORP; TAIYO CHEM CO LTD

**Patent Family**

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JP 8169478	A		7	B65D-081/34	

**Abstract:**

JP 8169478 A

A paper-like base material consists of one or more heat-resistant conductive fibres selected from a C fibre, metal fibre, and whiskers having an electrically conductive layer on their surface, and one or more heat-resistant fibres selected from a glass fibre, ceramic fibre, and heat-resistant synthetic fibre. One or more C based electrically conductive powder selected from C black, activated C and graphite are papered in the base material. Also claimed is the prodn. of the heating sheet by papering one or more C-based electrically conductive powder and one or more metal-based electrically conductive powder selected from Ni-Cr and stainless steel in the paper-like base material.

**USE** - Used as a heating sheet for heating and cooking in a microwave oven.

**ADVANTAGE** - The use of the C-based electrically conductive powder heated, using microwave irradiation and the metal-based electrically conductive powder, increases temp.. Moisture evapn. is evolved from the food, burning the food before the food is hardened. The use of the heat-resistant electrically conductive fibre entails no burning or contraction. Papering the C-based electrically conductive powder and the metal-based electrically conductive powder provides the sheet with high electrical resistance. Generated electrical current is efficiently converted into Joule heat, entailing less spark. The sheet has flexibility, allowing fabrication, including honeycomb or corrugate fabrication to form a dish or cup shape.

Dwg.1/1

評価点	評価基準
1	全く焦げていない
2	部分的に焦げ目が付いている
3	全体に焦げ目が付いている

Derwent World Patents Index

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# PATENT ABSTRACTS OF JAPAN

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(22)Date of filing : 20.12.1994

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KISHI MINORU

(54) HEAT GENERATING SHEET FOR MICROWAVE HEATING COOKING AND PRODUCTION THEREOF

(57)Abstract:

PURPOSE: To obtain a heat generation sheet for microwave heating cooking that can form a good scorch before food is hardened by transpiration of water content and has a superior durability and obtain a production method therefor.

CONSTITUTION: In a heat generation sheet for microwave heating cooking and a production method thereof, one or more kinds of carbon-based conductive powder selected out of carbon black, activated carbon, and graphite are contained in a paper substrate made of one or more heat-resistant conductive fiber selected out of carbon fiber, metal fiber, and whisker with a conductive layer on the surface thereof and one or more heat-resistant fiber selected out of glass fiber, ceramic fiber, and heat-resistant synthetic fiber.

## LEGAL STATUS

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(54) 【発明の名称】 マイクロ波加熱調理用発熱シート及びその製造方法

(57) 【要約】

【目的】 食品が水分蒸散を起こして硬くなる以前に良好な焦げ目を付けることのできる、耐久性に優れたマイクロ波加熱調理用発熱シート及びその製造方法を提供する。

【構成】 炭素繊維、金属繊維及び表面に導電層を施したウイスキーから選ばれる1種若しくは2種以上の耐熱性を有する導電性繊維とガラス繊維、セラミックス繊維及び耐熱性合成繊維から選ばれる1種若しくは2種以上の耐熱性繊維からなる紙状基材内に、カーボンブラック、活性炭及び黒鉛から選ばれる1種若しくは2種以上の炭素系導電性粉体を抄き込んであるマイクロ波加熱調理用発熱シート、及びその製造方法。

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TECHNICAL FIELD

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[Industrial Application] In case this invention carries out cooking of the food with a microwave oven, it relates to the exoergic sheet for microwave heating cooking used in order to attach a scorch to this food, and its manufacture approach.

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## PRIOR ART

[Description of the Prior Art] The heating principle of the food by the microwave oven is the dielectric heating by microwave, vibrates violently the molecule of the water contained in food by the exposure of microwave, and heats food from the interior using the frictional heat then generated. For this reason, there are many merits, like cooking time amount is short, energy efficiency is good, and there is little loss of a nutrient.

[0003] However, although it is known that the scorch of the food which also has the fault resulting from it, for example, generates characteristic aroma by the amino-carbonyl reaction in one side since it is a self-heating from the interior of food is effective in the improvement in palatability at the time of eating and drinking, since a scorch is not attached outside, the fault that palatability is not good has a cooking article by the microwave oven.

[0004] Moreover, since the moisture inside foods shifts outside in reheating deep-fried dishes, tempura, etc. with a microwave oven, it also has the fault that batter is sticky.

[0005] Since such a trouble is solved, the various proposals of the exoergic sheet which has absorbed microwave in the past several years and generates heat are made, and a scorch can be attached to food with the heat of this exoergic sheet by applying to a microwave oven, where food is contacted on this exoergic sheet.

[0006] However, this kind of exoergic sheet [ each ] was conventionally far from if exoergic temperature is low, the point of having the problem referred to as inferior to endurance, expecting food, and attaching the scorch of a passage.

[0007] For example, the thing in which the metaled vacuum evaporatio~~no~~ film was formed on the base material which consists of paper, a polyethylene sheet, etc. is indicated by JP,60-15548,B and JP,63-1855005,U.

However, in order for electric resistance to make the metal vacuum evaporatio~~no~~ film which cannot generate the Joule's heat easily small generate heat by the exposure of microwave originally, it is necessary to set the thickness as magnitude from which the optimal resistance and the amount of currents are obtained within very thin limits below the marginal depth of microwave.

[0008] For this reason, since control of thickness is not only very difficult, but became what also has low exoergic temperature (180 degrees C / 1 minute), it was difficult to expect food and to attach the scorch of a passage. Moreover, since paper and a film were used as a base material, in the case of paper, it was easy to burn, and, in the case of a film, there was a problem of being easy to contract.

[0009] The thing it was made to make this ferroelectric generate heat by a \*\*\*\* lump and the exposure of microwave is indicated by heat-resistant paper in ferroelectrics, such as barium titanate, at JP,64-56193,U that this problem should be solved.

[0010] That a ferroelectric shows a high dielectric constant is only the case where the temperature is below Curie temperature, and since the Curie temperature of the barium titanate currently used here is 120 degrees C, when exoergic temperature exceeds 120 degrees C, this barium titanate will stop however, acting only as paraelectrics substantially.

[0011] Moreover, the burnt deposits of food are the times of barium titanate exceeding 120 degrees C like the above, since it generally generated at 220-250 degrees C, When it stops functioning only as paraelectrics, since the dielectric constant as paraelectrics is lower than the dielectric constant of the moisture in food, it becomes slow rapidly, and becomes later than food, the direction of the perspiration in food advances early before a burnt-deposits superintendent officer, and the rate of temperature rise of a heating element has the problem that food will become hard.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] The technical problem of this invention is to offer the exoergic sheet for microwave heating cooking excellent in endurance which can attach a good scorch, and its manufacture approach, before food causes perspiration and becomes hard.

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## MEANS

[Means for Solving the Problem] the carbon system conductivity fine particles which generate heat by the exposure of microwave in the paper-like base material which consists of the conductive fiber and the heat-resistant fiber [ \*\*\*\* ] which have thermal resistance [ \*\*\*\* ] as a result of repeating examination wholeheartedly, in order that this invention person may solve the above-mentioned problem -- \*\*\*\*\* -- based on a header and this knowledge, it came to complete this invention for the above-mentioned trouble being solvable by things.

[0014] That is, the exoergic sheet for microwave heating cooking characterized by this invention being \*\*\*\*\* about one sort or two sorts or more of carbon system conductivity fine particles chosen from carbon black, activated carbon, and a graphite into the paper-like base material which consists of one sort or two sorts or more of heat-resistant fiber chosen from the conductive fiber which has one sort or two sorts or more of thermal resistance chosen from the whisker which gave the conductive layer to the carbon fiber, the metal fiber, and the front face a glass fiber, ceramic fiber, and a heat-resistant synthetic fiber be offered.

[0015] This invention is explained to a detail based on a drawing below. the carbon system conductivity fine particles and the need which generate heat by the exposure of microwave in the paper-like base material with which drawing 1 shows the exoergic sheet which is one mode of this invention, and this exoergic sheet 1 consists of conductive fiber which has thermal resistance, and heat-resistant fiber -- responding -- metal system conductivity fine particles -- homogeneity -- and it is \*\*\*\*\* densely -- it is a thing. In the case of drawing 1, wave-like processing is performed to an exoergic sheet, and the slot 2 with a width of face [ of 3-10mm ] and a depth of 0.5-5mm is formed.

[0016] The melting point or softening temperature needs to have the thermal resistance of 800 degrees C or more at least, and, as for the conductive fiber which has the thermal resistance used in this invention, it is desirable that a volume resistivity value is 105 or less ohm-cm. When thermal resistance is low, fusion of fiber and contraction of a sheet take place, and when it is non-conductive, a scorch stops attaching.

[0017] As conductive fiber 3 which has this thermal resistance, what gave the conductive layer to the whisker is used suitably. For example, chemical vapor deposition, plating, etc. What used and gave the very thin conductive coating layer of several 10-100nm order to the whisker front face is used.

[0018] As a class of whisker, the tin oxide, antimony oxide, carbon, silver, etc. are suitably used as what gives conductivity that what is necessary is just to use potassium titanate, silicon nitride, silicon carbide, boron carbide, a zinc oxide, sapphire, boric-acid aluminum, etc.

[0019] What coated the front face of a potassium titanate whisker with the super-thin film carbon layer of several 10nm order with chemical vapor deposition as what is used especially preferably is used suitably.

[0020] Mixed use is carried out as a reinforcing agent, and 30-50 weight section mixing of said heat-resistant fiber is carried out to the conductive fiber 10 weight section which has thermal resistance. On-the-strength \*\*\*\*\* is carried out to their being less than 5 weight.

[0021] As carbon system conductivity fine particles which generate heat by the exposure of microwave, carbon black, such as furnace carbon black and acetylene carbon black, activated carbon, and a graphite are mentioned as such a thing that a volume resistivity value should just use the thing of 105 or less ohm-cm. Especially kish graphite with a mean particle diameter of 5-50 micrometers is used suitably. As for the content of carbon system conductivity fine particles, it is desirable to consider as 5 - 30 weight section to the conductive fiber 10 weight section which has thermal resistance. If there are few contents than 5 weight sections, febrility will fall.

[0022] As metal system conductivity fine particles 5, nickel-Cr and stainless steel are mentioned as such a thing that a volume resistivity value should just use the thing of 103 or less ohm-cm. Desirable mean particle diameter is 50-200 micrometers. As for the content of metal system conductivity fine particles, it is desirable to consider as 5 - 50 weight section to the conductive fiber 10 weight section which has thermal resistance. If there are few contents than 5 weight sections, febrility will fall.

[0023] In these fine particles, since the surface electrical resistance as an exoergic sheet 1 will become high and

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EFFECT OF THE INVENTION

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[Effect of the Invention] the carbon system conductivity fine particles which generate heat by the exposure of microwave in the paper-like base material which consists of conductive fiber which has thermal resistance according to the exoergic sheet for microwave heating cooking of this invention, and the need -- responding -- metal system conductivity fine particles -- \*\*\*\*\* -- a good scorch can be attached to food by things.

[0049] That is, the exoergic sheet for microwave heating cooking of this invention becomes possible [ attaching a scorch ], before food will cause moisture evaporation and will become hard according to the effectiveness of conductive fiber, carbon system conductivity fine particles, and metal system conductivity fine particles, since a temperature up is promptly carried out to predetermined temperature if microwave is irradiated.

[0050] Moreover, since the conductive fiber which has thermal resistance is used, problems, such as combustion or contraction, are not produced, carbon system conductivity fine particles and metal system conductivity fine particles are by \*\*\*\*\* in conductive fiber and the electric resistance as a sheet becomes high, the current to generate is efficiently changed into the Joule's heat, and a spark stops being able to generate it easily.

[0051] Furthermore, since the exoergic sheet for microwave heating cooking of this invention has flexibility, it fabricating, such as honeycomb processing and corrugated processing, is not only possible, but can be fabricated in the configuration of a pan, a cup, etc.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Industrial Application] In case this invention carries out cooking of the food with a microwave oven, it relates to the exoergic sheet for microwave heating cooking used in order to attach a scorch to this food, and its manufacture approach.

[0002]

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[0003] However, although it is known that the scorch of the food which also has the fault resulting from it, for example, generates characteristic aroma by the amino-carbonyl reaction in one side since it is a self-heating from the interior of food is effective in the improvement in palatability at the time of eating and drinking, since a scorch is not attached outside, the fault that palatability is not good has a cooking article by the microwave oven.

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[0005] Since such a trouble is solved, the various proposals of the exoergic sheet which has absorbed microwave in the past several years and generates heat are made, and a scorch can be attached to food with the heat of this exoergic sheet by applying to a microwave oven, where food is contacted on this exoergic sheet.

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[0012]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is to offer the exoergic sheet for microwave heating cooking excellent in endurance which can attach a good scorch, and its manufacture approach, before food causes perspiration and becomes hard.

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[0021] As carbon system conductivity fine particles which generate heat by the exposure of microwave, carbon black, such as furnace carbon black and acetylene carbon black, activated carbon, and a graphite are mentioned as such a thing that a volume resistivity value should just use the thing of 105 or less ohm-cm. Especially kish graphite with a mean particle diameter of 5-50 micrometers is used suitably. As for the content of carbon system conductivity fine particles, it is desirable to consider as 5 - 30 weight section to the conductive fiber 10 weight section which has thermal resistance. If there are few contents than 5 weight sections, febrility will fall.

[0022] As metal system conductivity fine particles 5, nickel-Cr and stainless steel are mentioned as such a thing that a volume resistivity value should just use the thing of 103 or less ohm-cm. Desirable mean particle diameter is 50-200 micrometers. As for the content of metal system conductivity fine particles, it is desirable to consider as 5 - 50 weight section to the conductive fiber 10 weight section which has thermal resistance. If there are few contents than 5 weight sections, febrility will fall.

[0023] In these fine particles, since the surface electrical resistance as an exoergic sheet 1 will become high and febrility will fall if there are few fine-particles particle numbers contained in the exoergic sheet 1 even if a volume resistivity value is below default value, it is necessary to adjust particle diameter and specific gravity suitably.

[0024] The exoergic sheet for microwave heating cooking of this invention removes water from the slurry which water was distributed in the distributed solution which carried out the distributed dissolution, and was obtained [ powder / clay ] in the mixture of the conductive fiber which has thermal resistance, the carbon system conductivity fine particles which generate heat by the exposure of microwave, and metal system

conductivity fine particles, uses it as a sheet-like object, and is manufactured by drying this.

[0025] As clay powder used in this invention, the powder of the clay powder which contains 4 - 10 % of the weight of aluminum, MgO minute 5-20 % of the weight, and H<sub>2</sub>O minute 5-15 % of the weight for 2O<sub>3</sub> minutes, for example, the Chianghsi clay produced by the China \*\*\*\*\*, is used suitably SiO<sub>2</sub> minute 40-70% of the weight. In addition to this as clay powder, the powder of brucite and attapulgite is also used suitably. As for clay powder, it is desirable to dry at 50-300 degrees C, and to use it as fine particles of 10-300 meshes.

[0026] In this invention, the clay powder of 1 - 10 weight section is first thrown in in water preferably to the water 100 weight section, and it agitates enough, and considers as the distributed solution of clay powder. Although dissolving in water completely is desirable as for clay powder, if clay powder is underwater distributed by homogeneity, no clay powder needs to not necessarily be dissolving in water. Therefore, the distributed solution in this invention means both, although homogeneity distributes in the solution without a part of the thing and clay which clay is dissolving in water completely dissolving.

[0027] Subsequently, the distributed solution of the clay powder preferably obtained by the above of the 400 - 2000 weight section to the total quantity 100 weight section of the above-mentioned conductive fiber, heat-resistant fiber, carbon system conductivity fine particles, and metal system conductivity fine particles is added, and it agitates until conductive fiber, heat-resistant fiber, carbon system conductivity fine particles, and metal system conductivity fine particles distribute to homogeneity in a solution. The thermal resistance of the sheet-like object which will be obtained if inorganic substances, such as alumina sol, a silica sol, phosphoric-acid aluminum, a zeolite, a magnesia, and xonotlite, are added if needed at this time improves. These additions have the desirable 10 - 100 weight section to the clay powder 100 weight section. Clay powder and an inorganic substance can also add and use for water what mixes beforehand and was made into the shape of a slurry.

[0028] Subsequently, if flocculants, such as a polymer coagulant, are added, clay will adhere to conductive fiber and conductive fiber, carbon system conductivity powder, and metal system conductivity fine particles will condense. Moisture is suitably removed by approaches, such as natural \*\*\*\* and reduced pressure \*\*\*\*. The amount of a flocculant is 3 - 10 weight section to the fiber 100 weight section preferably. The heat-resistant fiber and the conductive fine particles which were condensed, and clay are used as a sheet-like object with a thickness of 0.2-1mm, and subsequently, if this sheet-like object is preferably dried at 40-120 degrees C, the sheet for microwave heating cooking made into the purpose will be obtained. If this Plastic solid is calcinated with gradient temperature [ being still more desirable (ordinary temperature -500 degree-C-1000 degree C) ], the impurity contained in the organic substance and clay will be removed, the inorganic substance in clay sinters further, and thermal resistance improves. In this case, even if the organic substance is removed, a configuration is held with clay.

[0029] In order for the exoergic sheet 1 to generate heat in response to microwave, the physical-properties value as a sheet is also related in addition to the physical-properties value of the carbon system conductivity fine particles 4 and the metal system conductivity fine particles 5. That is, it is desirable that the surface-electrical-resistance value of the exoergic sheet 1 is 102 - 105 ohm-cm 2. Even if carbon system conductivity powder and metal system conductivity fine particles have agreed on said conditions, when condensation of these conductive fine particles and dispersion of thickness arise at the time of paper making, the phenomenon which is not desirable will occur.

[0030] After cover the bottom of food with the exoergic sheet 1, inserting food, or wrapping, or making it saccate and putting in food, if microwave is irradiated, carbon system conductivity powder and metal system conductivity fine particles will generate heat, the exoergic sheet 1 carries out a temperature up to predetermined temperature promptly, and a scorch is attached to the contact surface of food.

[0031] For this reason, while avoiding direct contact for food, it is desirable to coat a front face with a protective layer for the purpose of preventing adhesion of food. As such a thing, a silica system, a silicic-acid system, and a silicon system compound are mentioned, for example that what is necessary is just to use what has thermal resistance as a protective layer. As for the thickness of a protective layer, it is desirable to be referred to as 1-10 micrometers.

[0032] The exoergic sheet for microwave heating cooking of this invention can be made dished besides the above mentioned usage, can be used, being able to enclose with the dished glass flank and glass dished pars basilaris ossis occipitalis of a container, and is also applicable to microwave heating cooking.

[0033]

[Example] Although sequential explanation of these evaluation results is given below at the example of the exoergic sheet for microwave heating cooking, and its manufacture approach, and a list, this invention is not limited to these examples.

[0034] The powder (100 meshes of mean particle diameter) of the Chianghsi clay (a physical property and a chemical constituent are shown below.) of 20 weight sections is fed into an example 1 propeller type agitator to the water 200 weight section, and it agitates for several minutes, and checks that clay has dissolved underwater.

subsequently, the potassium titanate whisker (the DIN toll BK300 and the trade name made from Otsuka Chemistry --) which carried out carbon coating to this solution 220 weight section 0.3-0.6 micrometers of diameters of fiber, the fiber length of 10-20 micrometers 10 weight section, and ceramic fiber (SC1400 and the trade name by the Nippon Steel chemistry company --) 2.8 micrometers of diameters of fiber, the fiber length of 10mm 30 weight section, and a glass fiber (the Unitika, Ltd. make --) 6 micrometers of diameters of fiber, the fiber length of 3mm 7 weight section, and an aramid fiber (Conex --) the Teijin trade name, 0.1 micrometers of diameters of fiber, the fiber length of 30mm 3 weight section, and kish graphite powder (KNF-A15 and the trade name made from Mitsukazu Mineral concentrate --) The mean-particle-diameter of 25 micrometers 10 weight section and the SuS powder (mean particle diameter of 25.6 micrometers) 10 weight section are supplied and agitated, and it agitates until fiber distributes to homogeneity underwater. Subsequently, carry out 2 weight sections injection of the HAIMO lock (trade name made from Kioritz Organic) as a polymer coagulant at these fiber dispersion liquid, fiber is made to condense, subsequently fiber and water are separated, and it is thickness by the extract machine. The 0.4mm papyraceous material was manufactured. Five weight sections spreading of the silicic acid system coating agent was carried out, the protective layer was prepared in the front face of this paper, and the exoergic sheet for microwave heating cooking was produced.

[0035]

Physical property Chemical entity (% of the weight)

Relative density 2.40-2.60 SiO<sub>2</sub> 60.43 consistencies 300 aluminum 2O<sub>3</sub> 6.38 bulk density 525 Fe 2O<sub>3</sub> 2.30pH 9\*\*0.5 MgO 14.38 surface areas 259 CaO 1.28 whiteness degree 65 K<sub>2</sub>O 0.54CEC 26 Na<sub>2</sub>O 0.19 (rate of the cation exchange) TiO<sub>2</sub> 0.22 decoloring power 200 MnO 0.56 moisture (%) <15 H<sub>2</sub>O 11.83 flow powder The amount of destruction by fires (1000 degrees C) 13.36 Molecular structure type {calcium0.10K0.09N0.04} [(Mg5.46aluminum1.11Fe3+0.51 Ti0.02) Si11.19aluminum0.51]

In O30(OH) 4 (OH<sub>2</sub>)48H<sub>2</sub>O example 2 example 1, the exoergic sheet for microwave heating cooking was produced by the same approach except having not coated a front face with a protective layer.

[0036] In example 3 example 1, the exoergic sheet for microwave heating cooking was produced by the same approach except having made carbon system conductivity fine particles into carbon black (MABY Mitsubishi Kasei Corp. 100 mean particle diameter of 0.1 micrometers).

[0037] In example 4 example 1, the exoergic sheet for microwave heating cooking was produced by the same approach except having used carbon system conductivity fine particles as activated carbon (KINNORU BFG mean particle diameter made from KYATARA Industry of 10 micrometers).

[0038] In example 5 example 1, the exoergic sheet for microwave heating cooking was produced by the same approach except having made metal system conductivity fine particles into nickel-Cr (the product made from Japanese Atomization, mean particle diameter of 10 micrometers).

[0039] In example 6 example 1, the exoergic sheet for microwave heating cooking was produced by the same approach except having removed SuS powder.

[0040] Aluminum was vapor-deposited to the polyethylene terephthalate oriented film with an example of comparison 1 thickness of 12 micrometers by the thickness of 70A, and the laminating of the paper was further carried out to it.

[0041] The result evaluated by the appraisal method as shows below the sheet obtained in examples 1-6 and the example 1 of a comparison is shown in Table 4.

[0042] (Febrile appraisal method of an exoergic sheet) The sample with a magnitude of 18x18cm was promptly measured with the non-contact mold surface thermometer (Optex make) after heating for 1 minute under 100g coexistence of water with the microwave oven (the product made from Matsushita Housing Device: 600w).

[0043] (Burnt-deposits nature appraisal method of food) One bread (about 65g) was put on the sample, and the following criteria estimated the burnt-deposits nature of the contact surface with the sample when heating for 2.5 minutes with a microwave oven.

[0044]

[Table 1]

評価点	評価基準
1	全く焦げていない
2	部分的に焦げ目が付いている
3	全体に焦げ目が付いている

(Reheating nature appraisal method of food) The tempura (about 85g) of a shrimp saved in the refrigerator on



the 1st was put on the sample, and the following criteria estimated the crispy feeling of batter when heating for 1 minute with a microwave oven.

[0045]

[Table 2]

評価点	評価基準
1	水分や油分が滲出し、べたっとしている
2	かりっとした歯触りはないが、べたついていない
3	揚げたてと同様にカリッとしている

(Adhesive appraisal method of food) The following criteria estimated the adhesion to the sample of food at the time of evaluating the reheating nature of food.

[0046]

[Table 3]

評価点	評価基準
1	大分付着している
2	若干付着している
3	全く付着していない

[0047]

[Table 4]

	実施例						比較例
	1	2	3	4	5	6	1
秤量 (g/m <sup>2</sup> )	190	180	186	188	193	176	50
引張強度 (g/25mm)	1920	1350	1860	1790	2100	1640	4000
発熱性 (°C)	260	180	280	255	270	270	100
焦げ性	3	2	3	3	3	3	1
再加熱性	3	2	3	3	3	3	1
付着性	3	2	3	3	3	3	3

[0048]

[Effect of the Invention] the carbon system conductivity fine particles which generate heat by the exposure of microwave in the paper-like base material which consists of conductive fiber which has thermal resistance according to the exoergic sheet for microwave heating cooking of this invention, and the need -- responding -- metal system conductivity fine particles -- \*\*\*\*\* -- a good scorch can be attached to food by things.

[0049] That is, the exoergic sheet for microwave heating cooking of this invention becomes possible [ attaching a scorch ], before food will cause moisture evaporation and will become hard according to the effectiveness of conductive fiber, carbon system conductivity fine particles, and metal system conductivity fine particles, since a temperature up is promptly carried out to predetermined temperature if microwave is irradiated.

[0050] Moreover, since the conductive fiber which has thermal resistance is used, problems, such as combustion or contraction, are not produced, carbon system conductivity fine particles and metal system conductivity fine particles are by \*\*\*\*\* in conductive fiber and the electric resistance as a sheet becomes high, the current to generate is efficiently changed into the Joule's heat, and a spark stops being able to generate it easily.

[0051] Furthermore, since the exoergic sheet for microwave heating cooking of this invention has flexibility, it fabricating, such as honeycomb processing and corrugated processing, is not only possible, but can be fabricated in the configuration of a pan, a cop, etc.

[Translation done.]



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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] The perspective view of the exoergic sheet for microwave heating cooking of this invention

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## EXAMPLE

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焦げ性	3	2	3	3	3	3	1
再加熱性	3	2	3	3	3	3	1
付着性	3	2	3	3	3	3	3

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CLAIMS

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[Claim(s)]

[Claim 1] The exoergic sheet for microwave heating cooking characterized by being \*\*\*\*\* about one sort or two sorts or more of carbon system conductivity fine particles chosen from carbon black, activated carbon, and a graphite into the paper-like base material which consists of one sort or two sorts or more of heat-resistant fiber chosen from the conductive fiber which has one sort or two sorts or more of thermal resistance chosen from the whisker which gave the conductive layer to the carbon fiber, the metal fiber, and the front face, a glass fiber, ceramic fiber, and a heat-resistant synthetic fiber.


[Claim 2] The conductive fiber and the glass fiber which have one sort or two sorts or more of thermal resistance chosen from the whisker which gave the conductive layer to the carbon fiber, the metal fiber, and the front face, In the paper-like base material which consists of one sort or two sorts or more of heat-resistant fiber chosen from ceramic fiber and a heat-resistant synthetic fiber The exoergic sheet for microwave heating cooking characterized by being \*\*\*\*\* about one sort or two sorts or more of metal system conductivity fine particles chosen from one sort or two sorts or more of the carbon system conductivity fine particles, nickel-Cr, and stainless steel which are chosen from carbon black, activated carbon, and a graphite.

[Claim 3] The exoergic sheet for microwave heating cooking according to claim 1 or 2 which has coated the front face with the protective layer in order to prevent adhesion of food, while avoiding direct contact for food.

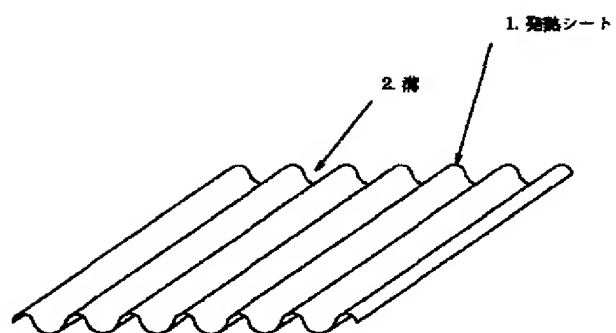
[Claim 4] The conductive fiber and the glass fiber which have one sort or two sorts or more of thermal resistance chosen from the whisker which gave the conductive layer to the carbon fiber, the metal fiber, and the front face, One sort or two sorts or more of heat-resistant fiber and carbon black which are chosen from ceramic fiber and a heat-resistant synthetic fiber, Mixture with one sort or two sorts or more of metal system conductivity fine particles chosen from nickel-Cr and stainless steel which were mixed one sort or two sorts or more of if needed [ the carbon system conductivity fine particles and if needed ] which are chosen from activated carbon and a graphite Chianghsi clay, The manufacture approach of the exoergic sheet for microwave heating cooking which one sort or two sorts or more of clay chosen from brucite and attapulgite distributes water in the distributed solution which is carrying out the distributed dissolution, removes water from the obtained slurry, considers as a sheet-like object, and is characterized by drying this.

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[Translation done.]

Drawing selection **drawing 1** 

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[Translation done.]